Report on Ecological Condition of Indiana's State Parks
2000

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Introduction
Assessment of the ecological condition of Indiana's state parks continued in 2000. Habitat condition was assessed within 21 state parks and four Nature Preserves during June and July to determine the need for a white-tailed deer reduction in 2000. This sixth year of annual assessment found the reduction program that has been implemented by the Department of Natural Resources is allowing recovery in parks that have had several years of annual removal. This report discusses the condition of each park and makes recommendations on deer reduction for fall 2000. It also recommends a new procedure for making annual decisions on deer reduction.

Methods
Heights of Sweet Cicley, Jack in the Pulpit and Baneberry were measured along transects at several locations within each park by state park naturalists during June of 2000. Height data was used with regression equations to estimate an adjusted percent cover in each park for all plants and flowering plants to determine a damage class for each park (see Table 1).

In addition several parks and nature preserves were examined to assess the condition of special habitats. For example Big Walnut Nature Preserve has a localized population of Canada Yew which is a favorite food of white-tailed deer. Twin Swamps Nature Preserve does not have the above indicator plant species and therefore required special examination.

Results and Discussion
Table 1 provides a summary of the mean heights of plants measured in each park, a calculated percent cover, and an assessment of damage class for each park. Height data from Table 1 was used with regression equations to calculate adjusted percent cover values for each park. An adjusted percent cover was used as an indicator of damage due to excessive deer browsing. Damage is given as four classes (light, moderate, heavy and severe). The light damage class is considered the background level of browsing by deer. The moderate damage class generally is representative of parks beginning to show excessive over browsing of localized areas with some plant species experiencing heavy browse. Parks in the heavy damage class are showing excessive browse throughout while those in the severe damage class have distinct browse lines and greatly reduced plant cover.

The following is a brief discussion of the ecological condition in each park in order of their occurrence in Table 1.

State Parks
Brown County: This park has had five years (1993, 95, 96, 97, 99) of reduction of the deer herd (see Table 2). The increase in number of deer removed/ square mile and H/E (removal/ hunter effort) from 1997 to 1999 indicates the deer herd increased due to no removal in 1998. However the increase was not large and indicator plant data for 2000 indicates the habitat is continuing to improve. This year's assessment indicates moderate damage compared to severe damage in 1999. This park is now in the maintenance phase

of deer management. Since it still is not clear whether the maintenance phase will require annual or biennial removal of deer, I recommend that this park not be hunted in 2000. Removal of deer in 2001 will allow evaluation of the increase over the two-year period from 1999 to 2001. If the herd continues to increase (indicated by an increase in the number of deer removed/square mile) above the 1999 level then an annual removal will be necessary.

Chain'O'Lakes: This park had its first deer reduction in 1998 due to moderate damage found in June, 1998. The 2000 data from indicator plants indicates a moderate level of damage. Lack of removal of deer in 1999 has reversed any benefit to habitat restoration occurring following the 1998 removal. This park clearly demonstrates the need for annual removal for several years once damage to the habitat has been documented. Removal of deer from this park needs to occur annually until the removal declines to 12-16 deer/sq. mile.

Charlestown: This property was managed as a federal military installation prior to becoming a state park in 1995. It has had deer removals for many years. The number of deer removed per hunter effort since 1995 is very similar to that found in Fish and Wildlife Areas. Periodic deer removal is required in this park as agreed to in its transfer from the military. The lack of flowering indicator plants indicates the lack of deer removal in 1999 has resulted in an increase in habitat damage. Visual inspection of the park's habitat indicates light to moderate damage. This park should be hunted in 2000.

Clifty Falls: This park had a removal in 1998. Due to the urban area around the park this removal was limited to archers only. Fifty-one deer/sq. mile were removed which is several times more than the habitat can support. The lack of deer removal in 1999 delayed restoration of the park's habitat. Data from 2000 indicates heavy damage due to excessive deer number. This park should be hunted annually until the removal declines to 12-16 deer/sq. mile.

Ft. Harrison: This is the second year of data collected on this park due to its relatively recent transfer from the military. Damage is considered heavy and indicates a deer removal program should be initiated. Under the program of assessment discussed later in this report, the first removal would not occur until 2001.

Harmonie: Forty-five deer/sq. mile were removed from this park in 1999. This coupled with the heavy damage still evident in the park indicates a removal should occur in 2000.

Indiana Dunes: This park had a deer reduction in 1998 and 1999. Removal dropped from 60 deer/sq. mile in 1998 to 34 deer/sq. mile in 1999. This year's (2000) data on habitat condition indicates possible improvement from 1999. Damage class changed from severe in 1999 to heavy in 2000. The deer herd should be reduced again in 2000.

Lincoln: A deer reduction program was initiated within this park in 1996 and continued in 1997 when 28 deer/sq. mile were removed. Deer were not removed from the park in

1998 or 1999. The lack of indicator plants indicates a decline in habitat quality. A visual assessment of this park indicates heavy browsing and a distinct browse line. This park should have a deer reduction in 2000.

McCormick's Creek: This park has had three deer reductions in 1996, 97, and 99. The number of deer removed in 1999 was 28/sq. mile. The habitat damage class is rated heavy for 2000. A reduction of deer in 2000 should bring deer number to a maintenance level.

Mounds: Indicator data indicates heavy damage is occurring in this park.
A deer reduction program should be initiated within this park in 2001.

Oubache: Indicator plant data indicates heavy damage is occurring in this park. A deer reduction program should be initiated in this park in 2001.

Pokagon: Indicator plant data indicate moderate damage in this park.
This park has had three deer reductions in 1995, 1996 and 1998. Removal of deer in 1998 were higher than that for Fish and Wildlife properties, but had not returned to 1996 levels. The habitat condition in this park is improving. Deer should be removed from this park in 2000.

Potato Creek: Indicator plant data indicates moderate damage in this park. This park has had four deer reductions in 1995, 1996, 1997 and 1998. The level of removal in 1998 was similar to that from Fish and Wildlife properties indicating that the deer herd has been reduced to a level for long-term maintenance of the park's habitats. Since ther was not a removal in 1999, this park should have a deer reduction in 2000.

Shades: The indicator plant data indicates moderate to heavy damage. This park has had three years of deer reduction in 1997, 1998, and 1999. The 1999 archery removal was ineffective in this park. This park should have a removal in 2000 using legal firearms.

Shakamak: The first deer reduction occurred in 1999 in this park with the removal of 42 deer/ sq. mile. Moderate habitat damage is still evident in this park. The reduction program should continue in 2000.

Spring Mill: The first deer removal occurred in 1999 with 35 deer/sq mile harvested. Moderate habitat damage is still evident in this park. The deer removal program should continue in 2000.

Summit Lake: This park needs more evaluation before a recommendation on deer removal can be made.

Tippecanoe: This park has had two years of deer harvest in 1997 and 1999. Seventy seven deer/sq. mile were removed in 1999. The lack of flowering indicator plants found in 2000 indicates that habitat damage is still evident. This park should have a reduction of deer in 2000.

Turkey Run: The deer reduction program initiated in 1999 should continue in 2000. Moderate habitat damage is still evident.

Versailles: Habitat damage is moderate in this park. This park has had three years of deer removal in 1997, 98, and 99. The removal in 1999 of 16 deer/sq. mile indicates this park is at the maintenance level. Removal does not need to occur this year. Removal in 2001 will allow assessment of deer increase over a two-year period.

Whitewater: The lack of flowering indicator plants indicates that habitat damage is still present. A deer removal program was initiated in this park in 1998. Forty-two deer/sq. mile were removed in 1999 which indicates that another removal should occur in 2000.

Nature Preserves:

Big Walnut: This Nature Preserve is divided into three separate land units. The middle unit has a population of Canadian Yew that is being damaged by excessive deer browsing. Indicator plant data indicates a moderate level of habitat damage. A deer removal program should be initiated.

Moraine: This preserve also shows moderate habitat damage and should have a deer reduction beginning in 2001.

Wesselman: Sharpshooters were used to remove deer from this preserve in 1999. Moderate habitat damage is still present indicating the removal should continue in 2000.

Twin Swamps: This Nature Preserve has heavy browsing on the understory woody plants and has a distinct browse line in some areas. Damage is rated as heavy to severe. A deer reduction program should be initiated.

General comments: Habitat damage from excessive deer is still evident in parks across the state. Seventeen of these parks have had one or more years of deer removal and habitat recovery is beginning to occur. This report identifies three parks that show habitat damage and have not had any deer removal. These are Ft. Harrison, Mounds, and Oubache. Summit Lake needs more evaluation before a recommendation on deer removal is made. Four Nature Preserves are also shown to have habitat damage. These are Big Walnut, Moraine, and Twin Swamps. Wesselman habitat indicates some improvement with the ongoing control program.

Recommendations:

Sufficient information is now available on habitat condition and deer removal that the following steps can be used to continue implementation of this program.

1. The initial decision to implement a reduction program within a specific park or nature preserve should be based on an assessment of the habitat (vegetation) condition (four parks and three preserves that have not had deer removal are identified in this report).

Damage will continue to be evident until the deer population has been reduced and maintained at lower levels for several years, so it is not necessary to continue to demonstrate annual damage once a deer reduction program is initiated. Assessment of habitat condition on a periodic basis (every three to five years) is useful in monitoring recovery as the deer population is maintained at a sustainable level.

2. Once a reduction program is implemented within a specific park or preserve, annual reductions should continue until the level of removal reaches 0.22 removal/hunter effort or 12 to 16 deer removed /square mile of park area.

3. Once the population is reduced, an annual or biennial program of deer removal should continue indefinitely (or until more suitable methods are developed) to maintain the population within balance with its habitat. Continued monitoring of the removal data will determine which time interval is correct.

4. Decisions should be made in March each year to allow enough time for planning the fall reduction program. The decision should be based on the removal data from the previous year or on habitat condition from the previous year for parks that have not had deer removed.

Under this recommended program only fifteen parks would have a deer reduction in 2000 including: Chain'o'Lakes, Charlestown, Clifty Falls, Indiana Dunes Harmonie, Lincoln, McCormick Creek, Pokagon, Potato creek, Shades, Shakamak, Spring Mill, Tippecanoe River, Turkey Run, and Whitewater. Brown County and Versailles would not be hunted during the fall of 2000. Reduction data for 2000 in parks (not hunted in 1999) such as Charleston, Potato Creek, Pokagon, Tippecanoe River, Whitewater, Chain'O'Lakes, and Clifty Falls would be examined to determine the increase in deer when a year is skipped between removal. Brown County and Versailles would be hunted in 2001 (along with all other parks hunted in 2000 in which removals remain above 15 deer/ square mile) and evaluated to determine the extent of increase in the deer herd. A removal program would be initiated at Ft. Harrison, Mounds, and Ouabache Parks in 2001. Further evaluation of habitat condition would be made in Summit State Park.

This program of orderly reduction of deer will allow more rapid recovery and long-term maintenance of the ecological balance within Indiana's state parks. I strongly encourage you to adopt it.

Table 1. Mean height of indicator plants measured by state park naturalists in June, 2000, calculated adjusted per cent cover, and habitat damage assessment

State Park	Sweet Cicley		Jack-in-the Pulpit		Baneberry		Mean adj. %Cover	Damage Class
	Fl.Plants	Non-Fl	Fl. Plants	Non-Fl	Fl. Plants	Non-Fl	Fl Plants	Fl plants
	Height centimeters		Height centimeters		Height centimeters			
Brown County	35.6	16.6	39.4	19.3			28.1	Moderate
Chain'O'Lakes	48.8		39.3		22.7		30.8	Moderate
Charlestown*				19.8				
Clifty Falls	45	26.7		24	14	12.7	25	Moderate
Dunes	26.3	13.5	25.5	17.5	26.5	11.2	21.1	Heavy
Ft. Harrison			24.6	29.1			18.1	Heavy
Harmonie	22		39.4		19.9		24	Heavy
Lincoln*	One small plant found on three transects							
McCormicks Creek	39.1	12.8	26.4	24.5	11.8	9.5	20.5	Heavy
Mounds	46.8	21.9	36.1	18.3	18.9	8.8	20.2	Heavy
Oubache			29.3	17.4			24.1	Heavy
Pokagon	34	12.4	36	21	23.5	13.3	26.4	Moderate
Potato Creek	49.5	36	34.6	20.6	23.8	15	29.5	Moderate
Shades	29.9	27.2	33.1	27.4	29.9	24.2	26	Moderate
Shakamak	49.5	8.5		25.5			30.1	Moderate
Spring Mill	26.4	14		17.6	36	17.9	27.8	Moderate
Sumit Lake*		42.7		23.4		37.3		
Tippecanoe*		35.5						
Turkey Run	38.4	29.3	35.7	31.4	26.7	30.3	28.5	Moderate
Versailles	40.5	14.3	32.9	21.1	16.1	18.7	24.7	Moderate
Whitewater*		36		20.4		22.6		
Nature Preserves								
Big Walnut	31.8	30.7	33.6	23.8	22.7	12.6	24.7	Moderate
Moraine	36.6		29.7		20.6		25.2	Moderate
Twin Swamps								
Wesselman	39.6	29.6		18.7	32		28.8	Moderate

* No flowering plants found on sample transects

Table 2. Deer removal per hunter effort (H/E) and per square mile by year for Indiana State Parks

Year	Brown Co		Charlestown		Harmonie		Potato Cr		Shades		Versailles	
	H/E	#/SqMi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi
1993	0.84	15.88										
1995	0.61	21.44	0.25	11.58	1.39	69.13	1.26	58.33				
1996	0.35	24.12	0.39	29.57	1.01	98.7	0.89	79				
1997	0.22	12.28	0.24	15.86	0.75	68.58	0.51	43.67	1.15	59.76	0.69	67.93
1998			0.21	13.11			0.27	22.67	0.32	30.92	0.29	27.52
1999	0.27	13.88			0.51	45.48			0.12	4.15	0.19	16.47

	McCormick Cr		Pokagon		Lincoln		Ind Dunes		Tippecanoe R		Whitewater	
	H/E	#/SqMi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi
1993			1.33	66.3								
1995												
1996	0.62	55.24	0.47	21.92	0.46	44.11			1.23	117.83	0.94	105.51
1997	0.32	24.48			0.38	27.63					0.4	42.38
1998			0.34	18.72			0.67	58.95				
1999	0.36	27.63					0.4	34.31	0.79	76.86		

	Chain'o'Lakes		Clifty Falls		Spring Mill		Shakamac		Turkey Run	
	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi	H/E	#/Sq Mi
1993										
1995										
1996										
1997										
1998	0.9	80.43	0.42	51.18						
1999					0.43	34.96	0.52	41.59	0.49	38.88

Note: Removal from Shades in 1999 and from Clifty Falls in 1998 was by bow hunters

Table 2. Percentage flowering [#flowering (f)/total (n)] and mean flowering height (FLOht, cm) of indicator species (white baneberry, sweet cicely, and jack-in-the-pulpit) occurring within areas sampled during June 1998. (—) indicates that no individual occurred within search areas.

	White Baneberry				Sweet Cicely				Jack-in-the-pulpit			
SAMPLE AREA	f/n	%	FLOht	std.	f/n	%	FLOht	std.	f/n	%	FLOht	std.
Harmonie SP	0/10	0.00	0.0	0.00	(---)	(---)	(---)	(—)	0/500	0.00	0.00	0.00
Indiana Dunes SP	23/83	27.71	25.2	9.53	157/203	77.34	21.6	7.59	12/692	1.73	29.3	6.27
Clifty Falls SP	0/27	0.00	0.0	0.00	4/14	28.57	53.0	21.59	75/634	11.83	33.3	6.04
Versailles SP	94/166	56.63	19.5	6.87	102/163	62.58	33.9	9.59	54/385	14.03	34.3	6.39
Spring Mill SP	573/596	96.14	31.9	9.94	418/420	99.52	39.1	11.15	328/510	64.31	38.6	7.11
Turkey Run SP	239/269	88.85	29.0	9.47	585/588	99.49	43.4	11.06	326/602	54.15	37.1	8.95
Control Areas												
Morgan Monroe SF	410/449	91.31	39.96	12.28	591/591	100.00	38.92	10.08	326/406	80.30	39.14	7.88
Indian Mounds Farm	233/340	68.53	32.13	9.50	7/9	77.78	36.29	3.99	110/427	25.76	40.23	6.37
Webster Farm	49/58	84.48	34.02	12.52	563/572	98.43	47.96	11.94	182/300	60.67	44.50	9.31